IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:
Prabhu, et al.

Serial No.: 10/693,683

Confirmation No.: 8666

Filed: October 24, 2003

For: Polishing Processes For Shallow Trench Isolation Substrates

Group Art Unit: 3723

Examiner: Jacob K. Ackun

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Commissioner for Patents
P.O. Box 1450
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CERTIFICATE OF MAILING
37 CFR 1.8
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January 17, 2006 — Date
Signature

Dear Sir:

APPEAL BRIEF

Applicants submit this Appeal Brief to the Board of Patent Appeals and Interferences on appeal from the decision of the Examiner of Group Art Unit 3723 dated August 12, 2005, finally rejecting claims 1-7 and 25-31. The final rejection of claims 1-7 and 25-31 is appealed. This Appeal Brief is believed to be timely since mailed by the due date of January 17, 2006, as set by mailing a Notice of Appeal on November 14, 2005. Authorization to charge the fee of $500.00 for filing this brief is provided on a separate fee transmittal. Please charge any additional fees that may be required to make this Appeal Brief timely and acceptable to Deposit Account No. 20-0782/APPM/007985/KMT.

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Real Party in Interest

The present application has been assigned to Applied Materials, Inc., 3050 Bowers Avenue, Santa Clara, California 95054.

Related Appeals and Interferences

Applicants assert that no other appeals or interferences are known to the Applicants, the Applicants' legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

Status of Claims

Claims 1-7 and 25-31 are pending in the application. Claims 1-24 were originally presented in the application. Claims 1-7 were elected with traverse in a Response to a four-way Restriction Requirement in an Office Action dated September 24, 2004. The Response amended claims 1 and 8 to correct typographical errors. The Examiner responded to Applicants' Response in an Office Action dated December 7, 2004 which withdrew claims 8-24 from further consideration as being drawn to non-elected species. In the Office Action dated December 7, 2004 the Examiner also rejected claims 1-7.

Claims 25-37 were added in Applicant's Response To Office Action Dated December 7, 2004. The Examiner issued a Notice of Non-Responsive Amendment Dated May 24, 2005 stating that new claim 32 was drawn to a non-elected species. Claims 25-37 were not entered. New claims 25-31 were added in Applicants' Corrected Response to Office Action Dated December 7, 2004. Claims 1, 3, and 4 were also amended. The Examiner responded to Applicants' Response in a Final Office Action dated August 12, 2005. In the Final Office Action, the Examiner found the Applicant's arguments regarding the patentability of claims 1-7 and 25-31 unpersuasive and substantially reiterated the same reasons for rejecting claims 1-7 and 25-31. Applicants filed a Response To Final Office Action Dated August 12, 2005 canceling claim 31 and presenting claim 32. Applicants received an Advisory Action dated October 25, 2005 indicating that the proposed amendments were not entered and that Applicants' Response did not place the application in condition for allowance.

Claims 1-7 and 25-31 stand rejected in view of *Bajaj et al.* as discussed below. The final rejection of claims 1-7 and 25-31 is appealed. The pending claims are shown in the attached Appendix.

Status of Amendments

In Response to the Final Office Action dated August 12, 2005 claim 31 was canceled and claim 32 was added after final rejection. The Examiner responded to Applicants' Response in an Advisory Action dated October 25, 2005. In the Advisory Action the proposed amendments were not entered by the Examiner.

Summary of Claimed Subject Matter

Claimed embodiments of the invention provide a method for planarizing a substrate surface with reduced or minimal defects in surface topography. (*See*, Paragraph 0015). The method comprises providing a substrate comprising a first dielectric material disposed on a second dielectric material. (*See*, Paragraph 0015). The substrate is polished with a first polishing composition and an abrasive-free polishing article until bulk first dielectric material is substantially removed. (*See*, Paragraph 0015). The substrate is polished with a second polishing composition and a fixed-abrasive polishing article to remove residual first dielectric material. (*See*, Paragraph 0015).

In the embodiments of independent claim 1, a method for processing a substrate 100 is provided. The method includes providing a substrate 100 (*See*, Paragraph 0034, Figures 2A-2C) comprising a bulk dielectric material 130 (*See*, Paragraphs 0034-0035, Figures 2A-2B) disposed on a patterned dielectric material (*See*, Figures 2A-2C) in an amount sufficient to fill feature definitions 135 (*See*, Paragraph 0034, Figures 2A-2C) of the patterned dielectric material (*See*, Figures 2A-2C). The method further includes polishing the substrate 100 with a first polishing composition (*See*, Paragraphs 0036-0038) and an abrasive-free polishing article (*See*, Paragraphs 0036-0037) until bulk dielectric material 130 is substantially removed (*See*, Paragraph 0036, Figures 2A-2B). The method further includes polishing the substrate 100 with a second polishing composition (*See*, Paragraph 0039) and a fixed-abrasive polishing article (*See*, Paragraph 0039) to remove residual bulk dielectric material 150 (*See*, Paragraph 0036, Fig. 2B) and expose the patterned dielectric material between the feature definitions 135 (Fig. 2A-2B).

In the embodiments of independent claim 25, a method for processing a substrate 100 is provided. The method involves providing a substrate 100 comprising a material layer 110 (*See*, Paragraph 0034, Figures 2A-2C), an oxide layer 115 (*See*, Paragraph 0034, Figures 2A-2C) disposed over the material layer 110 (*See*, Paragraph 0034, Figures 2A-2C), a patterned dielectric material (*See*, Figures 2A-2C) disposed on

the oxide layer 115 with feature definitions 135 extending through the three layers (*See*, Figures 2A-2C), a bulk dielectric material 130 disposed on the patterned dielectric material in a sufficient amount to fill the feature definitions 135 (*See*, Paragraphs 0034, Figures 2A-2C). The method further includes polishing the substrate 100 with a first polishing composition (*See*, Paragraphs 0036-0038) and an abrasive-free polishing article (*See*, Paragraphs 0036-0037) until the bulk dielectric material 130 is substantially removed (*See*, Paragraph 0036, Figures 2A-2B). The method further includes, polishing the substrate 100 with a second polishing composition (*See*, Paragraph 0039) and a fixed-abrasive polishing article (*See*, Paragraph 0039) to remove residual bulk dielectric material 150 (*See*, Paragraph 0036, Fig. 2B) to expose the patterned dielectric material between the feature definitions 135 (Fig. 2A-2B).

Grounds of Rejection to be Reviewed on Appeal

1. Claims 1-7 and 25-31 stand rejected under 35 U.S.C. § 102(b) as being unpatentable over U.S. Patent No. 6,261,157 to *Bajaj, et al.*

2. Claims 1-7 and 25-31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,261,157 to *Bajaj, et al.*

ARGUMENTS

A. Anticipation of Claims 1-7 and 25-31 by *Bajaj et al.*

Claims 1-7 and 25-31 stand rejected under 35 U.S.C. § 102(b) as being anticipated by *Bajaj et al.* (U.S. 6,261,157). Applicants have respectfully traversed the rejection based on the grounds that the invention does not teach, show, or suggest the invention as claimed.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the . . . claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

Applicants' have argued that *Bajaj et al.* does not teach, show, or suggest "each and every element as set forth in the claim." For example, *Bajaj, et al.* does not teach, show, or suggest removal of a bulk dielectric material as recited in independent claims 1 and 25. The Examiner stated that *Bajaj et al.* appears to disclose all the elements of claim 1, including polishing with an abrasive free article and polishing with a fixed abrasive article. The Examiner further stated that the material being removed by the abrasive free article in *Bajaj et al.* included bulk material as clearly taught in the reference. However, the Examiner avoided asserting that the reference removes a bulk dielectric material filling features in a patterned dielectric layer.

Bajaj et al. teaches pressing a semiconductor device against a first rotating polishing pad that has no embedded or abrasive particles to remove a portion of the conductive layer that overlies both the barrier layer and the insulating layer. (*See*, Abstract, col. 2: lines 46-49, and col. 7: lines 18-21). *Bajaj et al.* further discloses pressing the semiconductor device against a second rotating polishing pad that has embedded abrasive particles to expose a portion of the barrier layer that overlies the

insulating layer. (*See*, Abstract, col. 7: lines 34-36). Thus *Bajaj et al.* polishes bulk conductive material and does not teach or suggest removal of a bulk dielectric material as recited in the claims.

B. Obviousness of Claims 1-7 and 25-31 over *Bajaj et al.*

Claims 1-7 and 25-31 stand rejected under 35 U.S.C. § 103(a) as being obvious in view of *Bajaj et al.* Applicants have respectfully traversed the rejection based on the grounds that the invention does not teach, show, or suggest the invention as claimed.

The Examiner bears the initial burden of establishing a *prima facie* case of obviousness. *See* MPEP § 2142. To establish a prima facie case of obviousness three basic criteria must be met. First, there must some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Third, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *See* MPEP § 2143. The rejection failed to establish at least the first and third criteria.

As discussed above, *Bajaj et al.* polishes bulk conductive material and does not teach or suggest the removal of a bulk dielectric material as recited in the claims.

CONCLUSION

For the reasons stated above, Applicants respectfully submit that the rejection of claims 1-7 and 25-31 under § 102(b) and § 103(a) is improper. Reversal of the rejection of claims 1-7 and 25-31 is respectfully requested.

Respectfully submitted,

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CLAIMS APPENDIX

1. (Previously presented) A method for processing a substrate, comprising:

providing a substrate comprising a bulk dielectric material disposed on a patterned dielectric material in an amount sufficient to fill feature definitions of the patterned dielectric material;

polishing the substrate with a first polishing composition and an abrasive-free polishing article until bulk dielectric material is substantially removed; and

polishing the substrate with a second polishing composition and a fixed-abrasive polishing article to remove residual bulk dielectric material and expose the patterned dielectric material between the feature definitions.

2. (Original) The method of claim 1, wherein the first polishing composition comprises an abrasive-containing polishing composition.

3. (Previously presented) The method of claim 2, wherein the first polishing composition has a removal rate ratio of bulk dielectric material to patterned dielectric material of between about 1:1 and about 5:1.

4. (Previously presented) The method of claim 1, wherein the second polishing composition has a removal rate ratio of bulk dielectric material to patterned dielectric material of about 30:1 or greater.

5. (Original) The method of claim 1, wherein the fixed-abrasive polishing article comprises a high removal rate fixed-abrasive web material.

6. (Original) The method of claim 1, wherein the second polishing composition further contains abrasive particles.

7. (Previously presented) The method of claim 1, further comprising altering the surface of the fixed-abrasive polishing article with a non-mechanical technique selected

from the group of applying heat to the polishing article, chemical etching the polishing article, and combinations thereof.

8-24. (Canceled)

25. (Previously presented) A method for processing a substrate, comprising:

providing a substrate comprising a material layer, an oxide layer disposed over the material layer, a patterned dielectric material disposed on the oxide layer with feature definitions extending through the three layers, and a bulk dielectric material disposed on the patterned dielectric material in a sufficient amount to fill the feature definitions;

polishing the substrate with a first polishing composition and an abrasive-free polishing article until the bulk dielectric material is substantially removed; and

polishing the substrate with a second polishing composition and a fixed-abrasive polishing article to remove residual bulk dielectric material to expose the patterned dielectric material between the feature definitions.

26. (Previously presented) The method of claim 25, wherein the first polishing composition comprises an abrasive-containing polishing composition.

27. (Previously presented) The method of claim 26, wherein the first polishing composition has a removal rate ratio of bulk dielectric material to patterned dielectric material of between about 1:1 and about 5:1.

28. (Previously presented) The method of claim 25, wherein the second polishing composition has a removal rate ratio of bulk dielectric material to patterned dielectric material of about 30:1 or greater.

29. (Previously presented) The method of claim 25, wherein the fixed-abrasive polishing article comprises a high removal rate fixed-abrasive web material.

30. (Previously presented) The method of claim 25, wherein the second polishing composition further contains abrasive particles.

31. (Previously presented) The method of claim 25, wherein the bulk dielectric material comprises silicon oxide and the patterned dielectric material comprises silicon nitride.

EVIDENCE APPENDIX

No evidence is submitted by Applicants.

RELATED PROCEEDINGS APPENDIX

No copies of decisions rendered by a court or the Board are included because as stated on page 4, Applicants assert that no other appeals or interferences are known to the Applicants, the Applicants' legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

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Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL for FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT	($) 500.00

Complete if Known	
Application Number	10/693,683
Filing Date	October 24, 2003
First Named Inventor	Gopalakrishna B. Prabhu
Examiner Name	Jacob K. Ackun
Art Unit	3723
Attorney Docket No.	APPM/007985/PPC/CMP/CKIM

METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify) : _____

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For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee($)	Fee($)	Fee($)	Fee($)	Fee($)	Fees Paid ($)
Utility	300	150	500	250	200	100	____
Design	200	100	100	50	130	65	____
Plant	200	100	300	150	160	80	____
Reissue	300	150	500	250	600	300	____
Provisional	200	100	0	0	0	0	____

2. EXCESS CLAIM FEES

Fee Description	Small Entity Fee ($)	Small Entity Fee ($)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	200	100
Multiple dependent claims	360	180

Total Claims	Extra Claims	Fee($)	Fee Paid ($)
____ -20 or HP=	____	x ____	= ____

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims	Extra Claims	Fee($)	Fee Paid ($)
____ - 3 or HP=	____	x ____	= ____

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims	
Fee ($)	Fee Paid ($)
____	____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee ($)	Fee Paid ($)
____ - 100 =	____	/ 50 = ____ (round up to a whole number) x		= ____

4. OTHER FEE(S)

	Fees Paid ($)
Non-English Specification, $130 fee (no small entity discount)	____
Other (e.g., late filing surcharge) : Appeal Brief	$500.00

SUBMITTED BY

Signature	Robert W. Mulcahy	Registration No. (Attorney/Agent) 25,436	Telephone (713) 623-4844
Name (Print/Type)	Robert W. Mulcahy		Date January 17, 2006

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